

## ANALYSIS OF THE VEGETABLE SECTOR IN GIURGIU COUNTY, ROMANIA

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### Abstract

*This paper aims to present the evolution of agriculture in Giurgiu County in the period 2016-2020, analyzing in particular the production of vegetables. In order to highlight the main trends in agricultural production, statistical data were analyzed for the following vegetables: potatoes, tomatoes, eggplant, white cabbage, peppers and garlic. The total vegetable production registered at the level of Giurgiu county increased by 22,649 tons, from 63,896 tons in 2016 to 86,545 tons in 2020, the highest increase being registered for tomatoes, at the level of 2020, registering an increase of approximately 99% compared to the production obtained in 2016, this was largely due to the financial support provided, both through direct payments and the possibility to access European funds to make investments in this sector. At the level of this year, Giurgiu county is on the fourth place in the top of the counties with the most beneficiaries of the forms of support granted to vegetable growers within the program to support the production of vegetables in protected areas, their share being 7.1% of the total number of beneficiaries at national level, and the amount due related to the area was 2.02 million euros, representing 6.6% of the total amount allocated to the program at national level.*

**Key words:** *vegetables, cultivated area, production, price, financial support, Giurgiu County, Romania*

### INTRODUCTION

At the level of Romania, the vegetable market is strongly fragmented, the transfer of raw materials from producer to processor, distributor and consumer being deficient, due to the precarious form of organization. The health crisis caused by the Covid-19 pandemic has exacerbated this fragmentation, with imports showing an increasing trend, leading to a weak trade balance at national level. Vegetables are imported mainly as fresh products, but also as frozen products, and market demand is generally constant throughout the year, with the exception of the holiday season, when demand increases slightly [3, 10, 11, 13].

In 2018, tomatoes were the product with the lowest degree of self-sufficiency insurance, this being 73%. In this context, vegetable production needs to increase in order to better meet the needs of the internal market and to support exports to the EU market [2, 11].

A major vulnerability of the vegetable sector is represented by the poor organization of

local producers (less than 1% of producers are part of producer groups or organizations, the EU average being 45%). In our country only 4 of the 24 existing producer organizations currently participate in the operational program within the common market organization (cooperatives). Reluctance to associate, poor consultancy, a lack of understanding of the advantages of the common organization of the agricultural market and the difficulty of complying with contracts are just some of the factors which contribute to this situation [2, 9].

The purpose of this paper is to present an overview of the vegetable sector in Giurgiu County in the period 2016-2020, analyzing the cultivated area, production and average annual prices for the main vegetable crops. During the paper were presented and analyzed data on the number of producers benefiting from the support provided to vegetable growers in 2021 and the amounts granted, through programs to support vegetable production in protected areas, data officially

presented by the Agricultural Directorate of Giurgiu County.

**MATERIALS AND METHODS**

The research is based on statistical data provided by the Giurgiu County Directorate of Statistics and the Agricultural Directorate of Giurgiu County, for the period 2016-2020. During the research, the following statistical indicators were calculated and analyzed:

**Arithmetic mean**, calculated as the ratio between the sum of the values in the data series and the number of years taken into account.

$$m = \frac{x_1 + x_2 + \dots + x_n}{n}$$

**The standard deviation** that indicates how much the values are dispersed from the mean.

$$\sigma = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n - 1}}$$

where:

$\sigma$  = standard deviation;

$x_i$  = data series values over a number of years;

$n$  = number of years considered.

**Coefficient of variation:**

$$C = \frac{\sigma}{\bar{x}} * 100$$

It takes values between 0 and 100%. Between 0-10% attests a higher degree of homogeneity of the series, between 10-20% - medium variation; over 20% - large variation.

**The annual growth rate**, it shows what is the annual growth of the analyzed phenomenon:

$$r = \sqrt[n-1]{\prod \left( \frac{p_n}{p_{n-1}} \right)} - 1$$

$r$  = average annual growth rate;

$\prod p_n/p_{n-1}$  = chained growth indicators [4].

**RESULTS AND DISCUSSIONS**

Statistical data on Giurgiu County, at the level of 2020, attest to the fact that the total agricultural area is 259,251 hectares, representing 3.1% of the total agricultural area of Romania (8,375,739 hectares), the categories of agricultural use being diverse, indicating a potential high agricultural.

Giurgiu County is a predominantly agricultural county, the value of vegetable agricultural production registering an upward trend, in 2019 there was an increase of 53% compared to 2016, from 958,924 million lei to 1,470,195 million lei. From the calculation of the linear regression it results that the value of the vegetal agricultural production in the county increased on average by approx. 17,518 million lei per year (Figure 1).

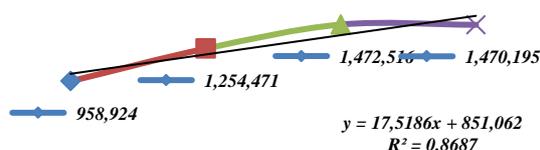


Fig. 1. The evolution of the value of the vegetal production in Giurgiu county (millions of lei)  
Source: Giurgiu County Directorate of Statistics [7].

However, the county is facing a lack of agricultural productivity, generated by: poor infrastructure, small size of agricultural holdings and other structural factors such as: the practice of subsistence farming. More than half of the county's population is active in subsistence agriculture, the county having an aging population, registering a negative evolution of the labor supply. Thus, the main economic activity, agriculture, is practiced in a percentage of over 50% in subsistence regime, by the aging population [5].

The county is representative for the plain area of the country and has a very high potential for vegetable production both in the field and in protected areas, due mainly to the high natural fertility of the chernozem soil, but also the temperate continental climate. However, the producers in the county face problems in terms of the market, the grouping of vegetable growers in associations and producer groups is a great opportunity to capitalize on products at much better prices, with the ability to negotiate prices and achieve deliveries to supermarkets/ hypermarkets [6].

An example in this sense is represented by the BioProd Colibași cooperative from Giurgiu county. The establishment of the cooperative in Colibași commune started from the

evaluation of the horticultural potential of the area near the commune, where approximately 500 vegetable growers work, cultivating an area of about 400 hectares. At the level of 2017, the year in which the cooperative was established, it consisted of 6 members, with an area of 7 hectares of vegetables, as well as 40 hectares of melons. Their small number in the cooperative was largely determined by the fact that most young farmers had access to European funds with the status of legal entities, which did not give them the legislative right to join the cooperative. The purpose of setting up the BioProd Colibasi cooperative was to attract non-reimbursable European funds for the establishment of a vegetable processing plant and a warehouse for sorting and packaging products [1]. BioProd Colibasi Agricultural Cooperative, founded in 2017, in order to find a market for vegetable growers in the commune, had in 2020 a turnover of 29.2 million lei, almost

five times higher than in 2018 and profit of almost one million lei. (Table 1).

Table 1. Financial data from BioProd Colibasi Agricultural Cooperative, Giurgiu County, Romania.

| Years | Fiscal value | Nr. employees | Profit / loss |
|-------|--------------|---------------|---------------|
| 2017  | 0            | 0             | -12,072       |
| 2018  | 6,304,951    | 0             | -532,166      |
| 2019  | 28,803,883   | 0             | 1,044,368     |
| 2020  | 29,177,467   | 29            | 93,540        |

Source: website of the Ministry of Finance, Accessed on 23.09.2021 [8].

Analyzing the area cultivated with the main vegetables in Giurgiu County, the following were noted: the largest area was recorded in tomatoes, in the period 2016-2020, registering an average of 1,054 hectares and limits between 1,021 hectares in 2016 and 1,081 hectares in 2019.

Table 2. The area cultivated with vegetables at the level of Giurgiu county (hectares)

| Nr. crt. | Specification    | Years |       |       |       |       | Minimum | Maximum | Average | Standard deviation | Coefficient of variation (%) | Annual growth rate (%) |
|----------|------------------|-------|-------|-------|-------|-------|---------|---------|---------|--------------------|------------------------------|------------------------|
|          |                  | 2016  | 2017  | 2018  | 2019  | 2020  |         |         |         |                    |                              |                        |
| 1.       | Potatoes - total | 580   | 577   | 579   | 581   | 579   | 577     | 581     | 579.2   | 1.48               | 0.26                         | -0.04                  |
| 2.       | Tomato           | 1,021 | 1,042 | 1,057 | 1,081 | 1,069 | 1,021   | 1,081   | 1,054   | 23.43              | 2.22                         | 1.16                   |
| 3.       | Eggplants        | 335   | 330   | 347   | 346   | 341   | 330     | 347     | 339.8   | 7.26               | 2.14                         | 0.44                   |
| 4.       | White cabbage    | 716   | 714   | 865   | 865   | 857   | 714     | 865     | 803.4   | 80.77              | 10.05                        | 4.60                   |
| 5.       | Pepper           | 503   | 503   | 518   | 508   | 466   | 466     | 518     | 499.6   | 19.76              | 3.95                         | -1.89                  |
| 6.       | Garlic           | 253   | 252   | 252   | 252   | 241   | 241     | 253     | 250     | 5.05               | 2.02                         | -1.21                  |

Source: Giurgiu County Directorate of Statistics [7].

At the opposite pole, with the smallest area was garlic, it recorded limits between 241 hectares in 2020 and 253 hectares in 2016 and an average area of 250 hectares. Following the analysis of the statistical indicators calculated for the area cultivated with vegetables, the following aspects were observed: the standard deviation registered limits between 1.48 hectares for potato cultivation and 80.77 hectares for white cabbage. The coefficient of variation indicates a homogeneous series of data for the area cultivated with potatoes, tomatoes, eggplants, peppers and garlic, with the exception of white cabbage cultivation which showed a medium variation of the data series. The annual growth rate registered negative values

for potato, pepper and garlic crops, which means a decrease in areas at the level of the analyzed period (Table 2).

There was a downward trend, with small oscillations, of areas cultivated with potatoes, peppers and garlic. Regarding the cultivated area with tomatoes, eggplants and white cabbage, the evolution trend was an ascending one, registering increases at the level of the analyzed period. The main cause that influenced the increase of the area cultivated with tomatoes was the granting of financial support through the "tomato program", which since 2021 has expanded and includes four types of vegetables: cabbage, eggplant, cucumbers and peppers. The tomato program has been running for a period of 4 years, the

amount of support provided during this period at national level being 172 million euros [12, 14].

At the level of Giurgiu county, through the tomato program, a number of 6,896 vegetable growers benefited from financial support, the value of the support being 88,844,686.68 lei (Table 3).

In 2018, a number of 1,813 producers were enrolled in the program, of which 1,495 in the first cycle and 318 in the second cycle. Of the 1,813 registered producers, 37 did not complete the program, resulting in a number of 1,776 beneficiaries this year (Table 3).

Table 3. Number of beneficiaries and support provided within the tomato program in Giurgiu county in the period 2017-2020

| Nr. Crt.     | Years | Number of beneficiaries | Amount per beneficiary (lei) | The total amount of support (lei) |
|--------------|-------|-------------------------|------------------------------|-----------------------------------|
| 1.           | 2017  | 1,301                   | 13,481.40                    | 17,539,301.4                      |
| 2.           | 2018  | 1,776                   | 13,797.90                    | 24,505,070.4                      |
| 3.           | 2019  | 2,058                   | 13,991.40                    | 28,794,301.2                      |
| 4.           | 2020  | 1,761                   | 10,224.88                    | 18,006,013.7                      |
| <b>Total</b> |       | <b>6,896</b>            | <b>51,495.58</b>             | <b>88,844,686.68</b>              |

Source: Giurgiu County Agricultural Directorate, <http://www.directiaagricolagiurgiu.eu/> [7].

The highest production was recorded for tomatoes, in the analyzed time the tomato production registered on average 25,346.4 tons, ranging between 16,034 tons in 2016 and 31,843 tons in 2020, the evolution trend being an upward one.

Table 4. Total vegetable production in Giurgiu county (tons)

| Nr. crt. | Specification  | Years  |        |        |        |        | Minimum | Maximum | Average  | Standard deviation | Coefficient of variation (%) | Annual growth rate (%) |
|----------|----------------|--------|--------|--------|--------|--------|---------|---------|----------|--------------------|------------------------------|------------------------|
|          |                | 2016   | 2017   | 2018   | 2019   | 2020   |         |         |          |                    |                              |                        |
| 1.       | Potatoes total | 7,297  | 6,063  | 5,592  | 5,064  | 4,685  | 4,685   | 7,297   | 5,740.2  | 1,014.95           | 17.68                        | -10.49                 |
| 2.       | Tomato         | 16,034 | 21,703 | 30,072 | 27,080 | 31,843 | 16,034  | 31,843  | 25,346.4 | 6,471.82           | 25.53                        | 18.71                  |
| 3.       | Eggplants      | 4,920  | 6,374  | 7,502  | 6,540  | 6,514  | 4,920   | 7,502   | 6,370    | 926.50             | 14.54                        | 7.27                   |
| 4.       | White cabbage  | 16,822 | 17,746 | 21,598 | 19,513 | 21,946 | 16,822  | 21,946  | 19,525   | 2,271              | 11.63                        | 6.87                   |
| 5.       | Pepper         | 6,632  | 7,116  | 7,992  | 7,773  | 7,028  | 6,632   | 7,992   | 7,308.2  | 560.43             | 7.67                         | 1.46                   |
| 6.       | Garlic         | 1,284  | 1,399  | 2,021  | 1,905  | 1,483  | 1,284   | 2,021   | 1,618.4  | 325.01             | 20.08                        | 3.67                   |

Source: Giurgiu County Directorate of Statistics [7].

Analyzing the evolutionary tendencies of the vegetable production analyzed at the level of the period 2016-2020 in Giurgiu County, the following were noted: the only crop that showed a downward evolutionary trend was that of potatoes, which registered a decrease of 36% in 2020 (4,685 tons) compared to

A significant production was also recorded for the white cabbage crop, it recorded an average of 19,525 tons, with limits between 16,822 tons in 2016 and 21,946 tons in 2020 (Table 4).

On the other hand, the lowest yields were obtained for crops of potatoes and garlic. Potato production recorded an average period of 5,740.2 tons, with variations ranging from 4,685 tons in 2020 to 7,297 tons in 2016. In terms of garlic cultivation, production recorded an average of 1,618.4 tons, ranging between 1,284 tons in 2016 and 2021 tons in 2018.

Analyzing the statistical indicators, the following were found: the coefficient of variation recorded for peppers, respectively 7.67%, was in the range 0-10% and attests a higher degree homogeneity of the data series.

In the tomato crop, a large variation of the data was observed in the analyzed time interval, the coefficient of variation of 25.53% exceeding the value of 20%. For the other cultures, the coefficient of variation was in the range of 10-20%, indicating a medium variation. With the exception of the potato crop where a negative annual growth rate of -10.49% was registered, the other crops registered increases of the total production, the most accentuated being of 18.71% for tomatoes (Table 4).

2016 (7,297 tons), the other crops analyzed showed an upward trend, registering increases in the analyzed period, the most significant increase, respectively 99%, being obtained from tomatoes.

According to statistical data, at the level of the period 2016-2020, the average annual prices

of the main vegetable products showed an upward trend (Table 5).

Table 5. Average annual prices of the main vegetables in Romania (lei/kg)

| Nr. crt. | Specification                         | Years |       |       |       |       | Minimum | Maximum | Average | Standard deviation | Coefficient of variation (%) | Annual growth rate (%) |
|----------|---------------------------------------|-------|-------|-------|-------|-------|---------|---------|---------|--------------------|------------------------------|------------------------|
|          |                                       | 2016  | 2017  | 2018  | 2019  | 2020  |         |         |         |                    |                              |                        |
| 1.       | Early, semi-early and summer potatoes | 1.11  | 1.12  | 1.61  | 2.06  | 1.7   | 1.11    | 2.06    | 1.52    | 0.41               | 26.73                        | 11.25                  |
| 2.       | Autumn potatoes                       | 1.4   | 1.34  | 1.37  | 2.09  | 1.92  | 1.34    | 2.09    | 1.62    | 0.35               | 21.77                        | 8.22                   |
| 3.       | White cabbage - early                 | 1.24  | 1.47  | 2.69  | 2     | 1.93  | 1.24    | 2.69    | 1.87    | 0.56               | 29.95                        | 11.70                  |
| 4.       | White cabbage - autumn                | 1.41  | 1.35  | 1.84  | 1.75  | 1.66  | 1.35    | 1.84    | 1.60    | 0.21               | 13.33                        | 4.17                   |
| 5.       | Tomatoes                              | 3.07  | 3.19  | 3.09  | 3.69  | 4.16  | 3.07    | 4.16    | 3.44    | 0.48               | 13.81                        | 7.89                   |
| 6.       | Long peppers - capia type             | 3.18  | 3.82  | 4.44  | 4.47  | 4.8   | 3.18    | 4.8     | 4.14    | 0.64               | 15.55                        | 10.84                  |
| 7.       | Bell-pepper                           | 2.43  | 2.62  | 3.14  | 3.49  | 3.69  | 2.43    | 3.69    | 3.07    | 0.54               | 17.65                        | 11.01                  |
| 8.       | Red-pepper                            | 3.02  | 3.88  | 4.54  | 4.52  | 4.91  | 3.02    | 4.91    | 4.17    | 0.74               | 17.82                        | 12.92                  |
| 9.       | Eggplants                             | 1.98  | 2.84  | 2.45  | 2.77  | 3.46  | 1.98    | 3.46    | 2.70    | 0.54               | 20.14                        | 14.97                  |
| 10.      | Garlic                                | 13.49 | 15.57 | 14.59 | 14.69 | 16.43 | 13.49   | 16.43   | 14.95   | 1.11               | 7.40                         | 5.05                   |

Source: Giurgiu County Directorate of Statistics [7].

Of the crops analyzed in this study, the most significant price was recorded for garlic, which has an average price of 14.95 lei/kg, with oscillations between 13.49 lei/kg in 2016 and 16.43 lei/kg in 2020, followed by the red pepper, which recorded an average price of 4.17 lei/kg and limits between 3.02 lei/kg in 2016 and 4.91 lei/kg in 2020. the opposite pole, the vegetable crop with the lowest price was represented by potatoes, with an average of the period of 1.52 lei/kg and variations between 1.11 lei/kg in 2016 and 2.06 lei/kg in 2019. Following the analysis of statistical indicators calculated for the average annual prices of vegetables in Romania, in the analyzed period there was a standard deviation between 0.21 for white cabbage and 1.11 for garlic. Regarding the coefficient of variation, the crop with the highest degree of homogeneity of the data series was that of garlic. Autumn white cabbage crops (13.33%), field tomatoes (13.81%), capsicum (15.55%), bell pepper (17.65%), red pepper (17.82%) and eggplant (20.14%) showed a medium variation, and white cabbage (29.95%), early potatoes (26.73%) and autumn potatoes (21.77%) were the crops that recorded a large variation of the average annual price in the analyzed time interval (Table 5).

Within the program to support the production of vegetables in protected areas, out of the total amount allocated at national level, respectively 30.76 million euros, over 2 million euros will be collected during this year by the 1,011 growers in Giurgiu County (Table 6).

Table 6. List of counties with the most beneficiaries of the forms of support granted to vegetable growers in 2021- Program to support vegetable production in protected areas - top 5 counties

| Nr. Crt.                          | County         | Number of beneficiaries | % of total beneficiaries | Amount due for the area (million euros) | % of the total amount allocated to the program (euro) |
|-----------------------------------|----------------|-------------------------|--------------------------|---|---|
| 1.                                | Olt            | 4,514                   | 31.6                     | 9.03                                    | 29.3  |
| 2.                                | Galati         | 3,153                   | 22.1                     | 6.31                                    | 20.5  |
| 3.                                | Dolj           | 1,486                   | 10.4                     | 2.97                                    | 9.7   |
| 4.                                | <b>Giurgiu</b> | <b>1,011</b>            | <b>7.1</b>               | <b>2.02</b>                             | <b>6.6</b>  |
| 5.                                | Buzau          | 660                     | 4.6                      | 1.32                                    | 4.3   |
| <b>Total the first 5 counties</b> |                | <b>10,824</b>           | <b>75.8</b>              | <b>21.65</b>                            | <b>70.3</b>   |
| <b>TOTAL</b>                      |                | <b>14,271</b>           |                          | <b>30.72</b>                            |   |

Source: Giurgiu County Agricultural Directorate, <http://www.directiaagricolagiurgiu.eu/>[7].

Thus, 6.6% of the amount allocated to the program is accessed by Giurgiu County, followed by Buzău with 4.3%, on the first place being Olt County with 29.3%. The 5 counties presented total 10,824 cultivators, representing 75.8% of the total producers at national level, and 70.3% of the amount

allocated to the program is intended for these counties (Table 6).

Analyzing the data from the program to support garlic production, it is noted that out of 1,016 growers enrolled in the program, 53.8% of growers (549 producers) are from the counties of Buzau, Olt, Teleorman, Botosani and Giurgiu (Table 7).

Table 7. List of counties with the most beneficiaries of the forms of support granted to vegetable growers in 2021-Program to support garlic production - top 5 counties

| Nr. Crt.                   | County    | Number of beneficiaries | % of total beneficiaries | Amount due for the area (million euros) | % of the total amount allocated to the program (euro) |
|----------------------------|-----------|-------------------------|--------------------------|---|---|
| 1.                         | Buzau     | 146                     | 14.3                     | 0.66                                    | 21.5  |
| 2.                         | Olt       | 140                     | 13.7                     | 0.38                                    | 12.2  |
| 3.                         | Teleorman | 107                     | 10.5                     | 0.33                                    | 10.8  |
| 4.                         | Botosani  | 106                     | 10.4                     | 0.26                                    | 8.6   |
| 5.                         | Giurgiu   | 50                      | 4.9                      | 0.18                                    | 5.8   |
| Total the first 5 counties |           | 549                     | 53.8                     | 1.82                                    | 58.9  |
| TOTAL                      |           | 1,016                   |                          | 3.08                                    |   |

Source: Giurgiu County Agricultural Directorate, <http://www.directiaagricolagiurgiu.eu/> [6].

The total area cultivated with garlic being 680.4 ha, totaling approximately 59% of the total. Of the amount of 3.08 million euros, allocated under the program, 1.82 million euros are allocated to the 5 counties mentioned in the table, representing approximately 59% of the total. The amount of 0.18 million euros (5.8% of the total) was allocated for Giurgiu County, an amount that will be redistributed to the 50 beneficiaries of the program (Table 7).

## CONCLUSIONS

Following the analysis of the technical indicators analyzed in this study, a potential for the development of the vegetable sector in Giurgiu County was noted. During the analyzed period, the production obtained for the main vegetables registering an increasing trend, with the exception of potato cultivation, the factor that determined the increase of productions being determined by the financial support granted within the program to support the production of vegetables in protected areas. It should be noted that although the areas cultivated with peppers and garlic have decreased, the productions recorded for these

crops have increased in the period 2016-2020. At the level of 2020, in Giurgiu county the most cultivated vegetables were tomatoes (31,843 tons) and white cabbage (21,946 tons).

Regarding the average annual prices, there was an increase in recent years, the increase being accentuated by the economic crisis caused by the Covid-19 pandemic, which had a direct impact on both prices and buying habits of Romanian consumers. , in increasing numbers, they prefer to buy agri-food products through online platforms. In this context, it is necessary to develop such a platform in Giurgiu County, in order to promote and support local agricultural producers.

Currently, Giurgiu County is facing problems in maintaining the status of agricultural county, the identification of sustainable ways of socio-economic development is imperative. Among the solutions identified for the recovery of agriculture in the county are: grouping small farmers into associations and producer groups and finding alternative solutions for irrigation systems.

The poor development of the competitiveness of agricultural holdings and the lack of educational training with agricultural specifics (agricultural high schools) in Giurgiu County, prevent producers from being competitive in the market. The promotion through information and education campaigns of young farmers in accordance with the new strategies in the agricultural field is the main solution for the recovery and development of agriculture in the county.

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